across the entire four-year study. Some dyads and trios, including males and females, showed association indices as high as 0.8 during this time. Although dolphins in the Bay of Islands are part of a larger and more widely ranging population, their patterns of associations resemble those reported for resident communities found in enclosed bays, providing insight into the various selective pressures acting on sociality in this genus.

Location and Timing of Haul-Outs of Individual Harbour Seals (*Phoca vitulina*) from the German and Danish Wadden Sea

Müller, Gabriele[1]; Liebsch, Nikolai[2]; Wilson, Rory P.[2]; Adelung, Dieter[1]
(1) Leibniz-Institut für Meereswissenschaften IFM-GEOMAR Kiel, Düsternbrooker Weg 20, D-24105 Kiel, Germany
(2) School of Biological Sciences, University of Wales Swansea, Singleton Park, Swansea SA2 8PP, Wales, UK

All pinnipeds are dependent on land or ice for activities such as breeding, molting and resting. The duration of haul-out periods is dependent on both the species as well as the putative purpose of the haul-out. Of the many species that make more or less regular haul-outs outside the breeding and molting season, the harbour seal (*Phoca vitulina*) from the German and Danish Wadden Sea may spend up to two weeks at sea before returning to land. Data from Harbour seals equipped with satellite telemetry and dead reckoning technology were used to determine the location of haul-out sites as well as the movement between haul-out sites undertaken by individuals. Haul-out data were also used to investigate the duration and timing of haul-out periods with respect to environmental factors such as tide. Most animals used more than one haul-out site although haul-out location was not changed on a trip-by-trip basis. Instead, seals returned repeatedly, sequentially to the same location before changing it. The timing and duration of haul-outs was highly dependent on the accessibility of sites during high tide. Animals from sandbanks that get flooded during high tide often made shallow dives with a low degree of activity during the high tide before hauling-out again as soon as substrate became available. On beaches seals may be hauled-out for more than two days, however, these periods are always interspersed with occasional short excursions into the water which may be caused by disturbance.

Discrimination of Stainless-Steel Spherical Out-Of-Phase Targets by an Echolocating *Tursiops truncatus*

Muller, Mark W.[1,2]; Ibsen, Stuart[1]; Au, Whitlow W.L.[1]; Nachtigall, Paul E.[1]; Breese, Marlee[1]
(1) Hawaii Institute of Marine Biology, 46-007 Lilipuna Rd., Kaneohe, HI, 96744, USA
(2) College of Engineering, University of Hawaii, 2540 Dole St., Honolulu, HI, 96822, USA

In this experiment the dolphin was asked to perform a discrimination task between two simulated targets. The echoes from these targets were created using a phantom echo generator which replicated the actual echo characteristics of a solid spherical stainless-steel target and a solid spherical stainless-steel target 180 degrees out of phase. The phantom echo system provided full knowledge of each click produced by the dolphin and the corresponding echo received by the dolphin. During the discrimination task the dolphin used a range of clicks that differed widely in peak frequency and bandwidth. However, the echoes that were returned to the dolphin showed significantly less variability in peak frequency and bandwidth and were similar with the exception of being 180 degrees out of phase. The goal of this study was to determine if the dolphin can detect phase shifts within the echoes. In other words, the goal was to decipher if the dolphin can discriminate between the two similar targets by solely using the phase difference information, or if the two echoes appear to be indistinguishable to the dolphin. Based on the results of this experiment, the dolphin did not appear to accurately discriminate between the two echoes. These results support the implication from previous experiments that because its discrimination performance fits the energy detection model, phase information is not required for the dolphin to make its discrimination.

Measurement of Auditory Temporal Resolution in the California Sea Lion (*Zalophus californianus*) Using Auditory Evoked Potentials

Mulsow, Jason[1]; Reichmuth Kastak, Colleen[1]; Supin, Alexander Ya[2]
(1) Univ. of California Santa Cruz, Long Marine Lab., 100 Shaffer Rd., Santa Cruz, CA 95060, USA
(2) Inst. of Ecology and Evolution, Russian Acad. of Sci., 33 Leninsky Prospect, 119071 Moscow, Russia

In contrast to studies of temporal auditory processing in odontocete cetaceans, the ability of non-echolocating marine mammals to resolve acoustic stimuli in time has received little attention. However, temporal resolution likely plays an important role in the ability of sea lions and other animals to distinguish relevant features of acoustic signals. We measured the temporal resolution abilities of the California sea lion (*Zalophus californianus*) using auditory evoked potentials. The auditory brainstem responses (ABRs) and rate following responses of two anesthetized California sea lions were recorded at the Marine Mammal Center in Sausalito, California. Stimuli were 20 ms click trains consisting of 70 is bipolar clicks presented at repetition rates between 125-1500 Hz. ABRs were measured from three subcutaneous electrodes and a customized amplification and averaging system connected to a PC laptop. At click presentation rates below 500 Hz, distinct individual brainstem responses were clearly visible following each click in a train. As presentation rates increased, responses to the initial click in a train remained relatively large with a typical ABR form while responses to subsequent clicks decreased in amplitude and became more sinusoidal. Rate following responses remained evident for click rates up to 1000 Hz. The results suggest that the temporal resolution capabilities of sea lions are better than previously suspected. These findings improve our understanding of auditory processing in sea lions, motivate additional comparative research with other pinnipeds, and provide guidance in the application of electrophysiological methods to the study of sea lion hearing.

Passive Acoustic Research on North Pacific Right Whales (*Eubalaena japonica*) in Alaskan Waters

Munger, Lisa M.[1]; Sauter, Allan[1]; Wiggins, Sean M.[1]; Hildebrand, John A.[1]; Moore, Sue E.[2]; Wade, Paul[2]; Rankin, Shannon[3]; LeDuc, Rick[3]; Barlow, Jay[3]
(1) Scripps Institution of Oceanography, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA, 92093-0205, USA
(2) NOAA National Marine Mammal Laboratory & Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, WA 98115-6349, USA
(3) NOAA Southwest Fisheries Science Center, 8604 La Jolla Shores Dr., La Jolla, CA, 92037, USA

We used two types of passive, underwater acoustic instrumentation to provide information on critically endangered North Pacific right whales (*Eubalaena japonica*) in the Bering Sea and western Gulf of Alaska. We deployed DIrectional Frequency Analysis and Ranging (DIFAR) sonobuoys during vessel-based cetacean surveys in Alaska in summers of 2002 and 2004 to detect and localize calling right whales and provide data on right whale acoustic repertoire and behavior. The most common call type (75%) among analyzed calls (n =385) was an upswept tonal call, on average from 88 Hz to 159 Hz and 0.82 s in duration. Real-time acoustic detection and localization of right whale calls preceded right whale sightings on most occasions, guiding the vessel to whales at unprecedented ranges (up to 100 km) and enabling researchers to conduct more detailed studies. We also deployed autonomous, seafloor-mounted hydrophones in three study areas: the southeast Bering Sea middle-shelf domain (in years 2000-2002 and 2004-2005), the Bering Sea shelf break (2004-2005), and the western Gulf of Alaska (2003). The seafloor packages recorded continuously at an effective bandwidth encompassing the most common North Pacific right whale calls. Automated detection software was configured to detect upswept calls, and detections were reviewed by an analyst, who also browsed data surrounding positive detections to find additional calls. In the southeast Bering Sea 2000-2002 seafloor hydrophone data, over 1000 right whale calls were detected, occurring seasonally as early as May and as late as November. Peaks in calling were observed during dark early-morning hours and at dusk. Right